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CLAIMS

What is claimed is:

- 1 1. A procedure for shutting down an operating fuel 2 cell system, wherein, during operation of the fuel 3 cell system, a continuous flow of air is being 4 provided to a fuel cell cathode from an oxidant source through a cathode flow field on one side of 6 an electrolyte, and a continuous flow of fresh 7 hydrogen containing fuel is being provided to a 8 fuel cell anode from a fuel source through an anode 9 flow field on the other side of the electrolyte. 10 and an electric current is being generated by the 11 fuel cell within an external circuit and is operating a primary electricity using device in the 12 external circuit, the procedure including the 13 14 following steps:
 - (A) disconnecting the primary electricity using device from the external circuit and stopping the flow of fresh fuel from the fuel source to the anode flow field; and, then
 - (B) displacing the fuel remaining within the anode flow field with air by blowing air into and through the anode flow field while venting the anode flow field exhaust.
 - The shut down procedure according to claim 1,
 wherein after step (A) and before step (B),
 connecting an auxiliary resistive load for a period of time across the anode and cathode in an external circuit.
 - 1 3. The shut-down procedure according to claim 2,
 2 wherein the auxiliary load is applied until the
 3 cell voltage is reduced to about 0.2 volts or less.
 - 1 4. The shut-down procedure according to claim 2,
 2 wherein the auxiliary load is applied until the
 3 cell voltage is reduced by 0.1 volt or more prior
 4 before step (B).

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- 1 5. The shut-down procedure according to claim 2,
- 2 wherein the size of the applied auxiliary load is
- selected to reduce the cell voltage to about 0.2 3
- 4 volts or less in less than 1.0 minute.
- The shut-down procedure according to claim 5. 1
- 2 wherein the auxiliary load continues to be applied 3 during step B.
- 1 The shut-down procedure according to claim 2,
 - wherein during the application of the auxiliary
- 3 load a flow of air is maintained through the 4 cathode flow field.
- 1 The shut-down procedure according to claim 1.
 - wherein the step of displacing the fuel comprises moving a front of air through the anode flow field
- 3 in less than 1.0 second. 4
- 1 9. The shut-down procedure according to claim 8, 2 wherein the front of air moves through the anode flow field in less than 0.2 seconds.
- 1 10. The shut-down procedure according to claim 9,
 - wherein the front of air moves through the anode
- 3 flow field in less than 0.05 seconds.
- 11. The shut-down procedure according to claim 9, wherein the flow of air to the cathode flow field 2 3 is stopped during the time the said front of air is
 - moving through the anode flow field.
- 1 12. The shut-down procedure according to claim 2,
- 2 wherein the step of displacing the fuel comprises 3 moving a front of air through the anode flow field
- 4 in less than 1.0 second.
- 1 13. The shut-down procedure according to claim 12,
- 2 wherein the air front moves through the anode flow
- 3 field in less than 0.2 seconds.
- 1 14. The shut-down procedure according to claim 12,
- 2 wherein the air front moves through the anode flow
- 3 field in less than 0.05 seconds.

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- 1 15. The shut-down procedure according to claim 1,
 2 wherein, during normal fuel cell operation under
 3 load, a recycle blower within a recycle loop
 4 recirculates at least a portion of the anode flow
 5 field exhaust through the anode flow field; and
 6 wherein in step (B) the air is blown into and
- through the anode flow field using the recycle
 blower and without recirculating the anode exhaust.

 1 16. The shut down procedure according to claim 15,
- wherein after step (A) and before step (B),
 connecting an auxiliary resistive load across the
 anode and cathode in an external circuit.
- 1 17. The shut-down procedure according to claim 16,
 2 wherein the step of displacing the fuel comprises
 3 moving a front of air through the anode flow field
 4 in less than 1.0 seconds.
- 1 18. The shut-down procedure according to claim 16,
 2 wherein the step of displacing the fuel comprises
 3 moving a front of air through the anode flow field
 4 in less than 0.2 seconds.
 - 19. The shut-down procedure according to claim 18, wherein the step of displacing the fuel comprises moving a front of air through the anode flow field in less than 0.05 seconds.
- 1 20. The shut-down procedure according to claim 19,
 2 wherein the auxiliary load is applied until the
 3 cell voltage is reduced to about 0.2 volts or less.
- 1 21. The shut-down procedure according to claim 17,
 2 wherein the auxiliary load is applied until the
 3 cell voltage is reduced by at least 0.1 volt before
 4 step (B).
- 22. The shut-down procedure according to claim 20,
 wherein the auxiliary load continues to be applied
 during at least a portion of step (B).

- 1 23. The shut-down procedure according to claim 21,
 2 wherein the auxiliary load continues to be applied
 3 during at least a portion of step (B).
- 1 24. The shut-down procedure according to claim 20, 2 wherein the auxiliary load continues to be applied 3 during step B until all the fuel has been displaced.